ON THE MEANING OF THE "REVERSE" IN BANDAGING.

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ALTHOUGH numerous treatises have been written on the subject of bandaging, and although many directions are to be found on the methods of applying particular forms of bandage to various parts of the body, one seldom finds a reference to any first principle that may underlie the rules for the mechanical procedure.

Most authorities start with the primary objects of a bandage, proceed to state that a reverse must be made while a bandage is traversing a cone and a figure of eight where two cones meet, and then give directions necessary for applying the bandage to each part of the body. This is, of course, all that is absolutely necessary. But it leaves in many minds the unsatisfied feeling of not knowing why, which it is well, so far as possible, to avoid. While a student under Mr. (now Professor) Chiene, my attention was first directed to this subject, and the admirable principles which he laid down as applicable to all forms of bandage have proved of great service to me ever since. These, I understand will be incorporated in a book shortly to be published. My object at present is to develop a particular branch of bandaging principles, an explanation of which I have hitherto been unable to find.

The question which never seemed to me to be answered was "why do we make a reverse while bandaging a cone?" Simple though the matter may be, it seems at least worth while to try to explain it. All authorities allow that certain parts of the limbs are conical in shape, and certain others cylindrical, while at given places two cones meet, either with their bases or with their apices in contact. Again, uniform tension producing uniform pressure is generally allowed to be one of the main features of a well applied bandage. Let us therefore start with that factor, *uniform pressure*, applied with a *bandage* to a *cylinder*, *cone*, or *junction of cones*.

If we consider a bandage as a strip of cloth of equal breadth throughout, whose edges are generally somewhat frayed, and therefore slack, we see that there is a good reason for the rule that every turn of a bandage must overlap the previous one. Otherwise, if the edges were only just in contact, however accurately, the parts of the limb beneath the middle of the bandage would be more firmly pressed upon than those at the margin. The object of the overlapping will therefore be to make up by the double application of the slacker parts at the edges for the greater firmness of the more tense portion in the middle. But to insure a uniform pressure, the edges must not only overlap, but overlap as nearly as possible to the same extent, hence each overlapping turn must have its edges parallel to those of the previous turns. There must, however, be also another element in the bandage: its surface must lie flat; and so, as the overlapping is dependent upon the parallel arrangement, we may take the two essential elements of bandage application to be

1. That the surface of the bandage must lie flat.
2. That its edges must be parallel in each successive turn.

Can we carry this out in a cylinder? If we try, we shall find that we can. At whatever angle to the long axis of the cylinder the bandage is applied, the surface of the bandage can always be kept flat, while the successive turns are also parallel. This is because each turn is exactly like the previous one, and the distance traveled by each edge of the bandage is always the same. With a cone, however, the case is quite different. Here while the length of the two edges of the bandage remains constant, the distance which each has to travel in order to encircle the cone is always different. Suppose we try to traverse a cone with, say, its apex downwards, as from above the ankle to the calf of the leg, and let us call that end of the bandage next the thicker or base end of the cone the upper edge, and the other the lower edge. Then if we carry the bandage round the cone, at any angle to its axis, the upper edge will be tightly applied while the lower edge is slack, having a less distance to travel. We may, if we please, make successive turns, keeping the edge of each parallel to the previous one, but as we do so we shall fail to carry out the first essential of the bandage, *i. e.*, its surface will not lie flat to the cone. If now we determine to keep the edges of the bandage equally tight and the surface flat, as we go on we must be constantly drawing on the lower edge, which has a less distance to travel, more than on the upper, and so be forcing the bandage to take a constantly increasing helix course (or thread of a screw with constantly increasing distance) until it ceases to pass round the cone at all and runs toward the base. In other words, the edges cannot be kept parallel. We therefore see, when we try to bandage a cone as we would a cylinder, that if we keep the edges of successive turns parallel, the surface will not lie flat, and that if we keep the surface flat, the edges will not remain parallel. Now it is just at this stage that the reverse comes in to help us. After a single turn—which as we have seen must be part of the thread of a screw—we reverse the edges of the bandage by folding them over, and so likewise alter the direction of the bandage. This undoes the disturbing effect of the cone, and so enables the successive turns to be practically parallel to one another, while the surface is also uniformly flat. The bandage is therefore folded over and over upon itself in the same way, the edges becoming alternately upper and lower at each turn. Since the tendency is to run towards the base, the reverse will always be toward the apex. It will further be easy to see that the steeper the slope of the cone the more abrupt will be the fold of the reverse.

But the explanation of the simple reverse carries with it also that of the figure of eight where two cones meet with their bases together, as well as that of a combination of turns and reverses on a single cone to which it is difficult to give a name. (In Edinburg it is generally known as Dr. P. H. Watson's bandage).

As to the figure of eight, I should like to premise that the term is used in two senses, sometimes in the strict sense, where there are two series of single loops, as in a spica at the ankle, groin, or shoulder, sometimes, however, where there is a complete turn given in addition to each loop, as may be done at the calf of the leg. The explanation, however, is the same in either case. It is simply this, that when the bandage has made a turn round the cone so that a reverse becomes necessary, the same effect as the reverse can be produced by carrying the bandage round a cone sloping in the opposite direction to the first. When this has been done, either a reverse can be made on the second cone, or the bandage can be brought back to the first cone, where it will now be ready to make a flat turn with its edges parallel to those of the last turn on this cone, and so on. Where the edges of opposing cones are pretty steep, or where a considerable distance has to be travelled, a single loop is sufficient to produce the desired effect, but where the slope is more gradual a complete turn will be required in addition. Again, where the slopes are different, a single loop might suffice for the steeper cone, while the additional turn is required for the other. It will be evident that the figure of eight method will only be applicable to the case of two cones with their bases together, because the tendency of the bandage is always toward the base of the cone, and thus toward the other cone, and not away from it as would necessarily be the case were the apices together. Finally it will be evident that this must be a secure method of bandaging, because the tendency of the bandage to slip from the broader to the narrower part of each cone will be always resisted by the turn round the opposite cone.

With regard to the combination of loops and reverses on a single cone, we must imagine a loop having been made, and the bandage carried up as if to go to the opposite cone, there being none, a sharp reverse is made instead, and the bandage is again brought back to make a loop as before. This method, of course, involves numerous turns over the same part, but such may be looked upon as the leading feature of the method when it is thought advisable to employ it.

I trust that the simplicity of the subject of this paper may not prevent it from helping to improve the ground work of the art of bandaging.